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Vol.		*Vol.*	
1.	3 numbers, 1928.	9.	4 numbers, 1938 (None of No. 2).
2.	4 ,, 1929.	10.	4 ,, 1939 (None of No. 4).
4.	4 ,, 1931.	12.	4 ,, 1941 (None of Nos. 1 and 2).
5.	2 ,, 1932.	13.	4 numbers, 1942.
6.	2 ,, 1933.	14.	4 ,, 1943.
7.	1 number, 1934.	15.	4 ,, 1944.
8.	4 numbers, 1935-37 (None of Nos. 2 and 4).		

ISSUES OF THE AGRICULTURAL CIRCULAR.

THE following were the numbers and year of issue of the *Agricultural Circular*:—

Vol. 1, 1920, 12 numbers.
,, 2, 1921, 5 ,,
,, 3, 1922, 4 ,,
Vol. 4, 1923, 1 number.
,, 5, 1924–5, 2 numbers.

As number 4 of Vol. 3 was printed as "Volume 4" and number 1 of Vol. 4 as "Volume 5" it would appear from an inspection of a complete set that Volume 4 comprised only a number 4 and that there were two issues of Volume 5, Part 1.

OLD ISSUES OF AGRICULTURAL BULLETINS.

FREE copies of the following Bulletins are available to Colonial Departments of Agriculture, research institutes and bona fide planters, etc.:—

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1. Sisal Hemp in Fiji, 1911.
3. Rhinoceros Beetle in Samoa, 1912.
4. The Banana in Fiji, 1912.
5. Scale Insect on I[illegible]nas, 1913.
6. Lemon Grass, 19[illegible].
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18. Control of Coconut Spike Moth, 1935.
19. Fruit Fly Investigations, 1936.
21. Biological Control of the Rhinoceros Beetle, 1941. Price 1s.
22. An Introduction to the Mosquitoes of Fiji, 1943.
Fijian Plant Names, 1942. Price 3s. 6d., 4s. and 6s.

Applications should be made to the Librarian, Department of Agriculture, Suva, Fiji.

—EDITOR.

CONTENTS.

VOLUME 16, No. 3, OCTOBER, 1945.

PAGE

EDITORAL, THE MANAGEMENT OF FERTILITY IN SOILS, *by W. J. B.* 61

TREATMENT OF RINGWORM IN HORSES, *by H. T. B. H.* 62

RICE PRODUCTION IN FIJI, *by M. D. ffrench-Mullen* 63

AGRICULTURAL NOTES, *by H. R. S.* 66

RICE IN THE WESTERN DIVISION, SEASON 1943–44, *by C. H.* .. 68

CONTROL OF NOXIOUS WEEDS IN TAILEVU AND NAVUA, *by B. E. V. Parham and J. J. C. Suckling* 71

NEW COPRA GRADING TABLE, *by Paterson and Dodds* 75

ANNUAL REPORT FOR THE YEAR 1944, *by C. Harvey* 76

ANNUAL REPORT OF ENTOMOLOGIST FOR 1944, *by R. J. A. W. Lever* . 87

ENTOMOLOGICAL NOTES, *by R. J. A. W. Lever*—

1. The Giant Toad in the Solomon Islands 88
2. Further Notes on the Plant Bugs *Cyrtorhinus* 89
3. A Newly Recorded Parasite, *Pachycrepoideus* 89
4. A Zanzibar Parasite for the Rhinoceros Beetle in Samoa .. 89
5. The Mosquito *Aëdes vigilax*—a Corrected Distribution for Fiji 90

MAP OF FIJI .. .. Back Cover

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AGRICULTURAL JOURNAL

ISSUED BY THE

DEPARTMENT OF AGRICULTURE, FIJI.

VOL. 16.] OCTOBER, 1945. [No. 3

EDITORIAL.

THE MANAGEMENT OF FERTILITY IN SOILS.

OUTSIDE the sugar cane and coconut plantation areas of the Colony good farming practices which have as their objective the maintenance of fertility in mineral soils are the exception rather than the rule and even at the cost of repeating an old, old story with which we are all familiar it seems that attention should be directed to the few basic principles which if intelligently and energetically applied are the secrets of good farming.

Fertility management is an art as well as a science and the principles hold with equal force in temperate as well as tropical regions. Conditions may vary from place to place, nevertheless it is possible to view the problem in terms of five main essentials.

Perhaps the main requirement is the establishment of good tilth. This is accomplished by the normal mechanical or hand operations of soil preparation and cultivation and involves the incorporation of plant residues which it has been authoritively stated accounts for thirty per cent of the soil fertility. The establishment of good tilth ensures adequate aeration and facilitates drainage and helps in the development of humus which gives the soil a good crumb structure. A soil with a good crumb structure resists erosion and, therefore, the development of a good tilth indirectly aids soil conservation.

An important requirement is the control of weeds which compete with the cultivated crops for moisture and nutrients. Weed control is closely associated with good tilth since, in the establishment of a good tilth, cultivation methods counteract weed development. It is well known in Fiji that weed control is one of the farmers main difficulties, but a greater measure of control must be secured if successful results are to be achieved.

Rotations suitable to the soil and region are a prime necessity in the management of a soil for the maintenance of fertility. This is particularly true in the humid tropics as the establishment of a proper rotation is the goal of all good farming practices. The sequence of crops is an important consideration in the development of good chemical, physical and biological conditions. A legume in the rotation is important for biological processes concerned with the nitrogen supply. Grass crops encourage humus accumulation and recent work in Africa has demonstrated the importance of the grass sod in the encouragement of good soil texture. Arable crops encourage to some extent the loss of soil nutrients but their residues form an important addition to the organic matter of the soil. The proper selection of crops plays an important and obvious part in erosion control and it is safe to say, in general, that no system of soil management is entirely satisfactory without a suitably designed rotation.

A good soil possessing satisfactory tilth will, under a well designed rotation system, continue to maintain adequate amounts of nitrogen, phosphoric acid, potash and lime provided that tilth is satisfactory. With poorer soils however, proper management may demand applications of farmyard manure,

compost lime and artificial fertilizers. Even with good soils it is often necessary to improve biological and chemical conditions by such additions. Good management dictates that adequate supplies of nutrients should be available at all times for the growing and ripening crops.

Finally, a phase of fertility management which is not often fully appreciated is the control of plant diseases and pests which often pass a part of their life cycle in the soil. Virulence of attack is controlled by cultivation and drainage techniques. The sequence of crops grown, the time of ploughing, the interval between crops and the burning of crop residues often have an important effect on the control of pests and diseases. The addition of chemicals to the soil may often have a marked effect such, for example, as the control of Panama disease of bananas by the liming of the soil to a high pH.

To summarize then, our basic principles in the management of fertility are the establishment of good tilth, the control of weeds, the institution of a suitable rotation, the supply of adequate, easily available plant food and the control of insect pests and diseases. These principles, despite the rapid advances that have been made in the many fields that constitute the science of agriculture, are still the essentials of good farming and we make no apology to our readers for again accentuating their importance. —W.J.B.

TREATMENT OF RINGWORM IN HORSES.

SINCE the last article appeared in this *Journal* regarding ringworm in horses the disease has spread to another part of the Colony and in case farmers in country districts of the outer islands are not familiar with the method of treating this disease the following may be of interest.

The best treatment so far found is a mixture of equal parts of dieselene (not diesel oil) and coconut oil. This should be applied once every three days to the affected areas. If it is applied more frequently there is danger of it injuring the skin of the animal. Care should be taken to see that it does not pour down the side of the body as if this happens the hair will be lifted from the area over which the lotion runs. If the skin of the back is broken it is best to apply an ointment to the broken areas and to keep the ringworm lotion away from the damaged skin. Care should be taken when applying the lotion to the head to see that none gets in the eyes. Treatment should be continued on the affected areas until the last trace of the disease has disappeared. Where much scurf and scale is present on the affected area it is a good idea to clear this away first with soap and water, making sure that the skin is thoroughly dried again before applying the mixture.

Another treatment often used with success is a lime sulphur wash which can be prepared as follows:—

lime	..	..	12 lb
sulphur	..	..	30 lb
water	..	..	100 gallons.

Slake the lime and make into a paste with sulphur then place in a cloth and boil for two hours in 15 gallons of water discarding the residue and using the fluid after making up to 100 gallons with water.

This can be sprayed on and used for a large number of horses. When only a few horses are to be treated a smaller quantity can be made up and can be applied with a piece of cloth. It should be applied daily.

Other treatments which also have been found effective are strong tincture of iodine or ten per cent salicylic acid or mycosol. Any one of these three will give about the same results but all three are expensive and can be used when only one or two horses are being treated. —H.T.B.H.

RICE PRODUCTION IN FIJI.

By
M. D. FFRENCH-MULLEN, D.I.C.T.A., A.I.C.T.A.,
Assistant Controller, Rice.

DURING the War period it has been impossible, for security reasons, to publish information relating to the production of rice in the Colony. With the cessation of hostilities and the lifting of the ban on the publication of crop statistics a brief summary of the rice position of the Colony is presented.

PRODUCTION.

(*a*) *Plantings.*—The collection of detailed statistics of acreages planted was commenced in 1943 but owing to staff shortages, complete details were not available. The 1944 and 1945 statistics were completed and are compared in Table I with available 1943 statistics.

TABLE I.

	Acreage planted			Per cent + or −	Per cent + or −	Per cent + or −
	1943.	1944.	1945.	1944 : 1943.	1945 : 1943.	1945 : 1944.
Southern Division—						
Non-Cane Farmers ..	3,943	4,745	4,148	+ 20·3	+ 5·2	− 12·5
Nausori Mill . ..	1,860	2,100	2,110	+ 12·9	+ 13·4	+ 4·8
Penang Mill . ..	514	800	638	+ 55·6	+ 24·1	− 20·3
Total ..	6,317	7,645	6,896	+ 21·0	+ 9·2	− 9·8
Western Division—						
Non-Cane Farmers ..	....	8,051	6,208	....	....	− 22·9
Lautoka Mill . ..	2,581	3,350	3,095	+ 29·8	+ 19·9	− 7·6
Rarawai Mill ..	2,712	2,989	2,137	+ 10·2	− 21·2	− 28·5
Total ..	....	14,390	11,440	....	....	− 20·5
Northern Division—						
Non-Cane Farmers ..	3,631	4,320	3,703	+ 19·0	+ 1·9	− 14·3
Labasa Mill	1,231	1,889	1,771	+ 53·4	+ 43·9	− 6·3
Total ..	4,862	6,209	5,474	+ 27·7	+ 12·6	− 11·8
Total for the Colony ..	....	28,244	23,810	....	....	− 15·7

+ increased percentage. − decreased percentage.

The acreage of rice harvested in 1944 was the largest recorded in the history of the Colony. The 1945 acreage was smaller than the 1944 but greater than the 1943 acreage. The 1945 planting fell some 4,434 acres short of the 1944, a decrease of 15·7 per cent. The Southern Division fell short by 749 acres, the Western Division by 2,950 acres and the Northern Division by 735 acres.

The fall in acreage in the Southern Division in 1945 is not considered to be as great as the 749 acres indicated by the survey. It is estimated that the survey figures for the Serua area alone are 400 acres lower than the actual due to conservative estimating.

In 1944, a considerable acreage of poor marginal land, unsuited to rice, was planted in the Western Division. The yield of padi from such land was negligible due to weed infestation and unsuitable soil. The fall in

acreage planted for the 1945 harvest is due mainly to a large reduction in planting on poor marginal land. Nevertheless the estimated yield for the Division is considered to be only slightly less than that of 1944. Rice plantings by cane farmers are lower than in 1944 owing to concentration on sugar cane planting.

In the Northern Division the fall in acreage for 1945 is due mainly to unfavourable weather conditions at planting. There was a 20 per cent fall in acreage in Cakaudrove due to lack of rain. The plantings in Bua province were similar in acreage to those in 1944.

(*b*) *Pests and Diseases*—The crop in both seasons under review was attacked in several areas by " Leaf Yellows " disease with which is associated the leaf-hopper, *Sogata furcifera*. There were several localized attacks of army-worm and cut-worms resulting in considerable loss in yield, particularly where control measures were not adopted or were too late in application. The leaf-roller pest of rice was much in evidence in 1944, severe attack being experienced throughout the Northern Division; the incidence of this pest appears to have been less in 1945. Methods for the control of rice pests and diseases were recommended to all farmers by officers of the Department of Agriculture. Methods were demonstrated in the field in selected areas. It is regretted that in many cases farmers did not avail themselves of the advice tendered.

The loss of crop caused by the rootings of wild pig, particularly in Ra and the more sparsely settled areas of the Nothern Division, has caused considerable concern. The increased incidence of this pest is due mainly to the absence of numbers of Fijians from their villages with the result that pigs are not hunted as frequently as heretofore. Farmers have not been prepared to pay pig-hunters, increase the number of licensed dogs or dig pig traps. Efforts are being made to develop an effective pig trap which would be cheap and permit of easy operation by farmers.

(*c*) *Yields*.—The 1944 harvest was estimated at 15,458 tons of rice. The 1945 harvest is estimated at 14,900 tons, a fall of 558 tons on the previous year's production. This fall is not as large as one would anticipate with a reduction of 4,434 acres in plantings because of the opinion, previously expressed, that the effective fall in each Division is less than shown in Table I. It is probable that the real reduction is no more than 1,500 acres for the Colony as a whole.

Consumption.

It is estimated that the consumption rate for the Indian population is 250 lb of rice per head per annum. The Indian population is approximately 125,000 and therefore the total annual consumption is 13,951 tons.

The consumption of rice by Chinese is believed to be 223 tons per annum for an estimated population of 2,000.

The consumption of rice by other races is estimated at 2,000 tons per annum and this estimate is regarded as conservative. Consumption by Fijians in country districts is particularly difficult to estimate but is considered to account for the greater proportion of the 2,000 tons.

At the completion of the 1944 harvest the rice position was assessed to the 1945 harvest as outlined in Table II. It was known that farmers had stored padi from the 1943 harvest but the amount could not be assessed. Accordingly stored padi is not considered in the calculations displayed in Table II.

TABLE II.

Stocks.	Tons.	Consumption.	Tons
Australian rice in hand	164	Indians	13,951
Local Production—1944 harvest	15,458	Chinese	223
Australian rice promised for delivery to May 1945	650	Other Races	2,000
Total ..	16,272	Total ..	16,174
Surplus at 1945 harvest	98		

At the 30th June, 1945, the surplus stocks of rice were 129 tons some 31 tons more than the estimate.

The Australian Government informed the Supply and Production Board that on receipt of the last shipment of rice in May 1945, no further supplies would be exported to the Colony for at least a year. Efforts were made, without success, to obtain supplies from alternative sources to meet the Colony's requirements. The rice position from the 1945 harvest to the 1946 harvest was assessed as follows:—

TABLE III.

Stocks.	Tons.	Consumption.	Tons.
Australian rice in hand	129	Indian	13,951
Local production—1945 harvest..	14,900	Chinese	223
Local production—out of season crop	43	Other races	2,000
Total ..	15,072	Total ..	16,174
Deficit at 1946 harvest	1,102		

It was considered that the Colony faces a shortage of 1,102 tons of rice if consumption by all races was allowed. As rice was unobtainable from overseas an endeavour had to be made to ensure that rice be available to those races in whose diet it is customary. Accordingly the Defence (Rice) Order 1945 published on the 3rd August was introduced to control the consumption of rice by other races. It is believed that by this means, an adequate supply of rice should be available to Asiatic races dependent on rice as a main staple.

The Supply and Production Board considered alternative methods of meeting the estimated rice shortage, namely:—

(*a*) the rationing of rice,
(*b*) the large scale production of rice by Government using mechanical aids;
(*c*) the hiring of tractor-plough-harrow units to farmers to expedite planting and consequent increase in acreage; and
(*d*) the production of an out of season crop in the 1945 to 1946 period by Government and private enterprise.

Methods (*a*) and (*b*) were rejected as impracticable and costly; method (*c*) is receiving consideration but difficulty is being experienced in obtaining suitable tractors; method (*d*) has been implemented by the planting of 56 acres of out of season rice on stations of the Department of Agriculture, a further 30 acres is also under preparation.

The rice position is under constant review and if rice again becomes available from overseas in sufficient quantity to materially reduce the Colony's deficit the lifting or alteration of the present restrictions would be immediately considered.

ACKNOWLEDGMENTS.

Mr. L. W. Harwood, Agricultural Officer, was responsible in the 1943 to 1944 rice season for the compilation and general interpretation of the rice statistics for the Colony as received from the Divisional Officers of the Department of Agriculture and the Colonial Sugar Refining Co., Ltd. Acknowledgment is made also to the Agricultural Officers and subordinate staff as well as to officers of the Colonial Sugar Refining Co. Ltd., for the collection of acreages planted under rice by 12,000 farmers in the 1943, 1944 and 1945 seasons.

AGRICULTURAL NOTES.

1. *Importation of Plant Material from Overseas.*—With the cessation of hostilities, gardeners and others will be considering the restocking of their gardens with various ornamental and flowering plants which can only be obtained by importation from overseas. For their information and guidance attention is drawn to the requirements of the Noxious Weeds and Diseases of Plants Ordinance 1929 and the regulations which have been issued from time to time concerning the importation of seeds, live stems and plants. It will be realized that already gardeners have a lot to contend with in keeping in subjection all manner of insects and diseases which persist in attacking their roses, tomatoes, cabbages, etc., and the idea behind the Ordinance referred to, is to prevent the introduction from other countries of other pests and diseases which are present in those countries and which if allowed to enter this Colony might bring disaster to gardeners, both amateur and professional, and also to the agricultural crops and community by the destruction of their means of livelihood. With this in mind, interested parties will understand the necessity for the Ordinance referred to and the procedure to which the general public are required to conform in the prevention of the introduction of other pests and diseases.

Persons requiring to import plant material from overseas should apply to the Director of Agriculture, Suva, for permission to import such material, which permission is usually readily granted; especially in the case of importations from Great Britain, Australia, Canada, New Zealand and U.S.A., except for those specified in Schedule I of the Ordinance, viz. coconuts, sugar cane, pineapples, unhusked rice, seed cotton, cotton seed, grass seed, clover seed, live stems and whole plants of pasture and fodder grasses, chaff, hay, straw whether used for packing or not, citrus plants, tobacco seed, cabbages, cauliflowers, lettuce, cut flowers. Permits to import must be obtained for any of these, but it is pointed out that pests not present in Fiji, occur on tobacco seed, cabbage, cauliflower, lettuce, etc., and for the present no permit would be granted in respect of these plants.

Also, because of the presence of a disease called " fire blight " in the Dominions of Canada and New Zealand, and in U.S.A., plants of the natural order Rosaceae, which includes, roses, strawberries, etc., are prohibited and no permit to import from these countries will be granted. Importations

from Australia are allowed. Further, in the case of seeds, live stems, and whole plants of pasture, fodder grasses and clovers, these should be accompanied by certificates signed by a responsible officer of the Department of Agriculture of the country in which they are grown, certifying that the district in which they were produced is entirely free from cattle tick infestation. Failure to comply with the requirements of the Ordinance referred to renders one liable to certain penalties, which fortunately, up to date, there has been no need to apply.

Finally the Ordinance provides that the Director of Agriculture, to whom all applications for permits must be addressed, reserves the right to decline to issue a permit, and has the power to prevent landing, to seize and destroy without compensation irrespective of whether a permit has been issued or not. It is obvious that the main reason for this is that should any serious outbreak of a pest or disease be reported after the permit has been issued, the Director of Agriculture has the power to take immediate action and so prevent the introduction of such pest or disease. Therefore if you desire to make importations of seeds and plant material inquire first of the Agricultural Department in Suva (preferably in writing), giving the popular and f possible the botanical names of the plants for which the permit is required, remembering that the issue of the permit is actually for the protection of your plants and those of your neighbours from unwanted pests and diseases.

In conclusion ordinary flower and vegetable seeds in packets, such as are commonly stocked and sold by the various stores in these islands, do not require any permit from this Department for their importation. —H.R.S.

2. *Cryocide.*—This material which has been strongly recommended by this Department for quite a long time for the control of various types of insect pests, especially caterpillars on rice and other crops, has recently had its effectiveness further demonstrated at the General Experiment Station, Sigatoka. A field of young rice badly infested with cutworm, was sprayed with a mixture made up of four ounces of cryocide to three gallons of water and applied to the young rice plants with a knapsack sprayer, with the result that all the caterpillars were destroyed and the rice crop saved.

Rice growers and others interested can obtain cryocide from the Department of Agriculture, Suva, or from the Agricultural Officer of their district, at the rate of 1s. per lb, the purchaser supplying his own container.

Cryocide is a proprietary article, similar to Cryolite, both being useful insecticides and less poisonous than arsenical sprays. Normally a spray can be made up of two to four ounces of cryocide to three gallons of water, but sometimes a stronger spray is required. It can also be used as a dust, at the rate of one part of cryocide to three parts of dry wood ash or similar fine materials. On the U.S. Army finishing work at their garden at Namaka, this Department at once applied for and took over the stock of cryocide on hand, so as to make it available to the farmers and others, at a cheaper rate than before, hence the price of 1s. per lb instead of 1s. 9d. per lb at which it was originally offered. —H.R.S.

3. *Crop Pests and Diseases.*—With the approach of the main planting season for food crops, farmers and others are reminded that they will find much useful information on the control of insect pests and diseases attacking their crops by reference to the small book, *Gardening Notes*, published by and obtainable from the Government Printer, Suva, at 1s. per copy. —H.R.S.

4. *Kumalas for Export to New Zealand.*—The major pest of kumalas grown in Fiji is the kumala weevil, *Cylas formicarius*.

Normal methods of control are to plant only young growing kumala shoots, since this weevil usually lays its eggs in the old growth, or even in the tuber itself if a portion of it should be exposed. When the tuber is attacked, the wound made by the weevil when laying its egg inside the tuber is so small that it quickly heals and becomes invisible to the naked eye until after the egg has hatched and the weevil bores its way through the tuber to the outside. It is important therefore to use young shoots for planting and, during cultivation, to see that all tubers are well covered with soil and thereby to prevent infection. It is this habit of the weevil which makes detection impossible when the tubers are presented for inspection to the Produce Inspector in Suva, as no inspection certificate can be issued guaranteeing the kumalas as being free from this pest when leaving Fiji.

New Zealand up to 1942 accepted annually many hundreds of bags of kumalas from Fiji, and no exception was taken to kumalas in commercially sound condition free from obvious weevil damage; it is apparent that with the reopening of this trade in 1945 the requirements of their inspection service have been severely tightened up so that no matter how thorough the inspection made in Suva, no guarantee can be given the shipper that the produce will be accepted on arrival in New Zealand, particularly as experience has shown that infection may take place in transit. Producers and shippers considering the exports of kumalas to New Zealand are therefore warned of the difficulties and risks that face them should they attempt it.

—H.R.S.

RICE IN THE WESTERN DIVISION, SEASON 1943-44.

The dependence on local production for most of the Colony's requirement of rice has necessitated close attention to the recording of planted acreages and the measurement of yields. Apart from the immediate necessity of knowing how much rice is being produced, these surveys have made available other information which is of interest to the agriculturalist, particularly in connexion with methods of cultivation and varieties grown.

These notes are based on figures taken from the Annual Report for 1944 for the Western Division by Mr. D. A. Donald, Agricultural Officer, and cover the Provinces of Nadroga and Navosa and Ba, i.e. the Western and Central Administrative District with the exclusion of the Province of Ra.

Table I shows how rice production was shared by cane growers and others. A larger number of cane growers planted rice but the average planting of the non-cane grower was, as is to be expected, in excess of that of the cane farmer. The particulars relating to cane farmers' rice acreages were obtained by courtesy of officials of the Colonial Sugar Refining Company.

Table II gives the race of the growers; nearly 99 per cent of the rice in the Division is grown by Indians, the average acreage of rice grown on each farm being 2·1 acres.

Table III shows the varieties planted and the method of planting; these particulars are available for rice planted by non-cane farmers only. The variety Bandala is by far the most popular with 43 per cent of the total

acreage, the next being China Motka with only 12 per cent. Of the 28 varieties recorded it is known that many are synonyms and there are actually fewer than 20 distinct varieties in this District. The classification of these varieties has been in progress at the General Experiment Station, Sigatoka, for the past three years. It would not be safe to draw definite conclusions on many points brought out in this table, which is based on a single season's survey; nevertheless, it can be seen that the popularity of the variety Bandala is due to its presumed suitability for broadcasing; China Motka and Mutmuria are also largely broadcast, while China Patna, China Patarka, Dihula, New Guinea, Patna, Patarka, Ram Bhog, Ramcajara and Table Rice are mainly transplanted. More than half of the total acreage planted was broadcast and a third, only, was transplanted.

Transplanting is most likely to give good yields, where soil and weather conditions are favourable, and broadcasting is usually resorted to only when time or labour is short. Table IV gives the yields obtained by the three methods and it shows that transplanting gave a yield half as much again as either drilling or broadcasting the seed. The season was generally a good one; this may account for the broadcast yield being almost equal to that obtained by drilling, as under adverse conditions it would be expected that drilling would show to more advantage.

The yield figures for each variety have been recorded but are not published here. Of the more popular varieties Patarka gave the best yield for transplanted rice with Ram Bhog next; of the varieties mostly broadcast, Bandala made the best showing. —C.H.

Table I—Rice Growers' Acreages.

	Number of growers.	Acreage planted.	Average acreage planted per grower.
Within cane areas	3,932	6,340	1·6
Outside cane areas. . . .	2,638	7,401	2·8
Total . .	6,570	13,741	2·1

Table II—Race of Rice Growers.

	Number of growers.	Acreage planted.	Percentage of total acreage.	Average acreage planted per grower.
Indian	6,458	13,556	98·7	2·2
Fijian	108	171	1·2	1·6
European	2	12	0·1	6·0
Chinese	2	2	....	1·0
Total . .	6,570	13,741	100·00	2·1

TABLE III—VARIETY AND METHOD OF PLANTING OUTSIDE CANE AREAS.

Variety.	Acreage.				Per cent of total planting.
	Transplanted	Drilled.	Broadcast.	Total of variety.	
Bandala	284	752	2,163	3,199	43
Bechua	1	....	1	2	..
Begam	3	....	2	5	..
Benzine (B.G.)	54	....	....	54	1
Chetua	1	....	....	1	..
China Patna	532	10	49	591	8
China	13	....	2	15	..
China Patarka	72	9	....	81	1
China Motka	85	19	823	927	13
Dihula	231	....	50	281	4
Gaji	117	8	19	144	2
Jodham	38	....	4	41	1
Kanakjir	1	....	....	1	..
Karia	78	3	18	99	1
Lakarawa	84	9	26	119	2
Lalka	2	11	14	27	..
Mutmuria	5	....	357	362	5
Motka	19	44	83	146	2
New Guinea	71	1	....	72	1
Patna	110	....	1	111	2
Patarka	144	9	9	162	2
Ram Bhog	192	12	19	223	3
Ramcajara	9	....	....	9	..
Rani	4	....	....	4	..
Sarya	5	96	370	471	6
Sona Calif	35	45	10	90	1
Suji	26	4	....	30	..
Table Rice	90	27	16	133	2
Total ..	2,306	1,059	4,036	7,401	100·00
Percent of total acreage..	31 per cent	14 per cent	55 per cent	....	..

TABLE IV—YIELDS ACCORDING TO METHOD OF PLANTING OUTSIDE CANE AREAS.

Method of planting.	Acreage planted.	Acreage failed.	Acreage harvested.	Average yield padi in lb per acre.
Transplanted	2,306	64	2,242	1,550
Drilled	1,059	65	994	1,090
Broadcast	4,036	120	3,916	1,000
Total ..	7,401	249	7,152	1,195

CONTROL OF NOXIOUS WEEDS IN TAILEVU AND NAVUA.

By
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J. J. C. SUCKLING, Dip. Dairying (Massey College), Agricultural Assistant.

In the present note the authors propose to record briefly the progress of work undertaken during 1945 to deal with proclaimed noxious weeds in the Southern Division. This work has two aspects (i) experimental and (ii) field and propaganda. The areas particularly involved are those described by proclamation ([1], [2], [3]); and comprise (*a*) part of Tailevu Province, approximate area 150 square miles, and (*b*) part of Serua and Namosi Provinces, approximate area 30 square miles. The experimental work has been localized at the Waimaro Agricultural Station, Tailevu; although, by way of example, all stations under departmental control were subjected to a rigorous weed eradication campaign during the early part of the year.

1. Experimental Work.

This has been limited to (i) practical weed eradication methods and observations as to cost and comparative efficiency, and (ii) observations on weed growth under varying conditions of grazing.

The proclaimed weeds dealt with are "hibiscus burr" or "qatima"* and *Solanum* or "kausoni"†, both being perennial shrubs characteristically forming pure stands where conditions are favourable, and both commonly occupying grazing land almost to the exclusion of grass growth.

Another serious weed dealt with was Muraina grass‡, a major pest of rice fields and cultivated land throughout the Colony.

At Waimaro the position in April 1945, was approximately as follows:—

A—Flat land, Fallow carrying a dense growth of Hibiscus burr and *Solanum*, 15 acres, of which three acres was also infested with a heavy growth of Muraina grass.

B—Hill land, Pastures, weed infestation heavy on five acres, light on 12·5 acres, a mixture of Burr and *Solanum*.

The Muraina grass was also heavy along fence lines, drains, in headlands and scattered throughout six acres of maturing rice fields. The origin of this weed was traced to the temporary occupation of a small area of land by Fijians between 1939 and 1942 for the purpose of rice cultivation. The centres of infestation were located on the sites where their crops had been thrashed at harvest time.

Hibiscus burr was in dense thickets, eight feet high, many plants had stems two to three inches in diameter and hand weeding was out of the question. This infestation was due to persistent cattle trespass by uncontrolled stock from neighbouring farms during the war period. At the time the work was undertaken, both the Burr and Muraina were commencing to flower, but the seed was as yet immature. Early action was therefore necessary and was taken as follows:—

Direct Control of Weeds.

Flat land. (Muraina grass): All grass heads were hand-rogued from rice fields before they matured, drains and fence lines were weeded with cane-knives, and the main area was disc-harrowed with the aid of a tractor.

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* *Urena lobata* L. † *Solanum torvum* Sw. ‡ *Ischaemum rugosum* Salisb.

A smaller area was ploughed-in before the flower heads matured, and the weed was killed; the implement used was an ordinary mould-board plough (B.O.). In the main area, the grass was almost eradicated by the discing. All rice fields were drained off and ploughed immediately after harvesting. The costs of the above operations are given below, Table 1.

Flat land.—(Hibiscus burr): Hand weeding of the burr on the flat land was regarded as too costly and too slow on account of the period of growth, so this was attacked with the tractor, using a light 10-disc harrow which was the only implement available. The results were very good but this implement was too light for the purpose and necessitated the land being gone over three times. The best results were achieved during damp weather, heavy rain alone preventing work. The manner in which the tractor and implements dealt with the heavy growth passed all expectation and with a suitable disc implement there is no doubt but that this is a rapid and economic way of dealing with such infestations on arable land.

The costs shown in Table 1 (*b*) may, on account of the limited equipment used, be regarded as considerably higher than necessary to make a thoroughly effective clean up.

Table 1. Weed Control at Waimaro Station.

Operation.	Area.	Cost.	Cost per acre.	Remarks.
		£ s. d.	£ s. d.	
(*a*) Muraina grass—				
Rice crop hand rogued ..	2·5	7 4 0	2 17 4	Estimate 90 per cent effective.
Headlands and drains cutlassed	1·5	4 16 0	3 4 0	Includes 30 chains of drains; 90 per cent effective.
Fallow disc-harrowed with tractor.	3·0	3 11 0	1 3 8	Heavy growth completely eradicated.
Totals ..	7·0	15 11 0	2 4 5	Cost per acre, average.
(*b*) Hibiscus burr and *Solanum* (Flat land)—				
Cutlassed by hand ..	1·5	2 16 0	1 17 4	Areas inaccessible to tractor: 80 per cent effective.
Disc-harrowed tractor	7·0	11 0 0	1 11 5	Three times, 90 per cent effective.
Totals ..	8·5	13 16 0	1 12 6	Cost per acre, average.
(*c*) Hibiscus burr and *Solanum* (Hill pasture)—				
Heavy growth cutlassed	5·0	14 0 0	2 16 0	80 per cent effective.
Light growth cutlassed	12·5	8 12 0	0 13 9	80 per cent effective.
Totals ..	17·5	22 12 0	1 5 9	Cost per acre, average.

Dealing with the results of the operations detailed in the above Table it was considered that the control of Muraina grass in fallow lands by the means employed, disc-harrowing or ploughing before the seed is mature, is thoroughly effective; also that hand-rogueing, albeit comparatively expensive is essential in the case of infested rice crops. It is estimated that by this method at least 90 per cent of the year's seeding was prevented. Subsequent decisions to grow an out-of-season crop of rice (New Guinea and Sonacalif varieties) on the area has resulted in complete control of this weed in the field. Incidentally the role of these two varieties in any programme

of weed control in rice land during the normal fallow season has thus been established and is one that should commend itself to the smallholder wishing to rid his land of this pest.

Observations on the areas of *Urena* and *Solanum* which were discharrowed only, as detailed in Table 1 (*b*), a method accessible and no doubt acceptable to the farmer, show an excellent degree of control accompanied by a good growth of herbage (Para and Thurston grasses, native *Paspalum*, sensitive plant and other palatable species). None of the original weed stand survived the treatment, and as this work was completed before the seeds were mature there has been to date very little growth of new plants.

The hand cutting of these weeds summarized in Table 1 (*c*) was undertaken as being the most suitable and most commonly practised by the farming community. The results are regarded as satisfactory; although occasional plants were missed, the work was quickly done at a low cost and the resulting growth of pasture has been very good.

Indirect Control of Weeds by means of Pasture Improvement.

In conjunction with the cleaning up of pasture land, the desirability of providing a better quality feed for the stock must not be overlooked. This is considered necessary on account of the generally low protein content of natural pastures in this area due to the absence of good legumes which results in greater pressure on the available grasses and in deterioration of the sward growth. Also to date in Fiji no really suitable legume to take the place of *Mimosa* has been established. Reports from Queensland confirmed by observations made locally (4) led the authors to select *Stylosanthes* as the most promising for the purpose. Trials have therefore been made to decide the best methods of propagating this species. An area of nearly one acre has been successfully established on hillside pasture land at the station. Trials were also made with *Pueraria* or tropical kudzu on flat land. It was found that cuttings do not strike well during the cooler months when simply set in the furrows and covered with the plough. More recently (August) success with this plant has been obtained using mature stem cuttings and rapid extension of this part of the work appears possible. An area of one and a half acres on the flat was set aside for the trial of these legumes and for observations on the natural succession which takes place when pasture land is closed to stock. The layout of these plots was designed also to enable observations to be made on the rate of spread of weeds in the field under normal conditions. The fodder trial plots are as follows: (*a*) *Stylosanthes*, (*b*) *Pueraria*, (*c*) *Centrosema*, (*d*) Para grass, all planted on land cleared of weeds by discharrowing only. These will be subjected to controlled grazing, an electric fence being used to enclose each plot as required.

Natural Succession in Pasture Land.

The reason for studying succession may be indicated by referring to the problem of controlling perennial weeds on such large areas of land which are not under "beneficial occupation" but which form extensive sources of infestation for neighbouring farms. Observations continued over a long period have shown that many perennial weeds persist only on land subjected to interference by grazing animals which destroy the palatable cover and promote conditions favourable to the former.

Table 2 summarizes the observations made to date on a block of $\frac{1}{4}$ acre left in the original state of weeds.

TABLE 2. PLANT SUCCESSION IN *Urena/Solanum* SHRUB ASSOCIATION WHEN CLOSED TO STOCK; WAIMARO STATION 1945.

[Degrees of dominance indicated: very common, dominant 10; subdominant 8; abundant 6; common 4; rare or occasional 2; very rare 1.]

Species.	Life-form.	Degree of dominance.		Remarks.
	Feet.	April.	Aug.	
A—Unpalatable plants—				
Urena lobata	Shrub, 6	10	4	Hibiscus burr.
Solanum torvum	,, 6	6	4	Solanum.
Psidium guayava	,, 3	2	2	Guava, young plants.
Jussiaea erecta	,, 5	8	6	Primrose willow.
Hyptis pectinata	,, 6	1	1	Mint weed, very rare.
Sida rhombifolia	,, 4	4	2	Pigweed, common.
Stachytarpheta urticaefolia .	,, 4	1	1	Rat-tail, rare.
Ageratum conyzoides ..	Herb, 3	2	1	Goatweed, temporary.
Cuphea carthagenesis ..	,, 3	6	2	Tarweed.
Phyllanthus sp.	,, 2	6	4	False sensitive plant.
Lobelia zeylanica	,, 1	6	4	Semi-prostrate.
Polygala paniculata ..	,, 2	4	0	
Cyperus sp.	,, 2	4	4	Sedge, tall.
Kyllingia sp.	,, 2	4	4	Sedge, short.
Ipomoea sp.	Liane.	2	4	Climbing small convolvulus.
Cuscuta	,,	2	4	Parasitic dodder.
B—Palatable plants—				
Desmodium heterophyllum .	Shrub, 3	2	2	Tall tick-trefoil.
D. triflorum	Herb, 1	1	2	Semi-prostrate.
Brachiara mutica	,, 3	1	4	Para grass.
Paspalum conjugatum ..	,, 2	4	8	Sour grass.
P. orbiculare	,, 2	2	6	Native paspalum.
Mimosa pudica	Shrub, 4	6	8	Sensitive, semi-prostrate.
Mikania micrantha . ..	Liane	6	10	Mile-a-minute, spreading.

The plot has, during the six months undergone considerable change, especially in the ground cover plants which have grown up well. The higher perennial shrubby weeds have been much overgrown by mile-a-minute, with *Mimosa* very abundant throughout. Grasses also have begun to dominate the smaller herbs.

2. FIELD WORK AND PROPAGANDA.

Active steps were taken early in the year to enlist the co-operation of all farmers throughout the proclaimed areas; to preparate a register of infested farms in these districts and to carry out the provisions of the Regulations issued under the Noxious Weeds and Diseases of Plants Ordinance 1929. In accordance with Regulation 29, the Director of Agriculture issued a notice in the Royal Gazette describing the manner in which these weeds were to be dealt with (5) and this was followed by the circulation of an appeal in English, Fijian and Hindustani languages. This latter circular drew attention to the above notice and to the fact that action was necessary before the 31st July.

The writers also completed detailed surveys of infested areas and visited most if not all the landholders throughout the areas. The response of most farmers has been very satisfactory and the active and efficient co-operation of the road overseers is recorded as an important contribution to the effort to m nimize the spread of these weeds. A summary of the work done during the year up to 31st July is given in Tables 3 and 4.

The condition of native lands continues to be a source of concern, particularly where these have been subjected to overstocking resulting in excessive weed growth and constituting a menace to neighbouring farms. This problem was given much attention, especially in the Navua area; where, with the co-operation of the Fijian authorities a good start has been made with the clearing of weed infestations of many years' standing.

TABLE 3. WEED CONTROL, TAILEVU.

Description of land.	No. of farms.	Areas		Remarks.
		Infested.	Cleared.	
		Acres.	Acres.	
Dairy farms—European ..	14	926	766	Twelve farms satisfactory.
Others ..	10	650	375	Heavy infestations on sublet areas.
Native land	..	460	..	Result of irregular occupancy for grazing.
Crown Land	..	88	85	Road reserves.

TABLE 4. WEED CONTROL, NAVUA.

Description of land.	No. of farms.	Areas		Remarks.
		Infested.	Cleared.	
		Acres.	Acres.	
Freehold—European ..	..	720	120	Comprises much undeveloped land.
Leases—Indian	55	130	83	Small-holdings.
Native land	4	135	62	Excessive growth.
Crown land..	..	8	8	Road reserves.

REFERENCES.

(1) Proclamation No. 8 (1939—*Solanum torvum* declared a noxious weed in Tailevu, *Roy. Gaz.*, No. 23, p. 169.
(2) Proclamation No. 32 (1941)—*Solanum torvum* and *Urena lobata* declared noxious weeds in Navua, *ib.* No. 82, p. 710.
(3) Proclamation No. 8 (1942)—*Urena lobata* declared a noxious weed in Tailevu, *ib.* No. 8, p. 36.
(4) Parham, B. E. (1944)—Plant Introductions 1933–1943, *Agric. Jour.*, Fiji, Vol. 15, No. 4, p. 94.
(5) Legal Notice 172 (1945)—Noxious weeds, *Roy. Gaz. Suppl.*, 18th May.

NEW COPRA GRADING TABLE.

"We suggest that the following ten characters might be suitable for the purpose, but in the light of experience and trial, one or more alternative characters may have to be substituted for some of those listed.

1. Colour.
2. Cleanliness.
3. Smokiness.
4. Mouldiness.
5. Maturity.
6. Smell.
7. Snap.
8. Whiteness of break.
9. Lustre.
10. Condition of watermark.

It should be noted that the last four characters listed are conjointly a measure of the dryness of the copra."—By D. D. Paterson and K. S. Dodds, Council Paper No. 29, Legislative Council, 1945.

ANNUAL REPORT FOR THE YEAR 1944.

By
C. HARVEY, M.L.C., Director of Agriculture.

INTRODUCTORY.

This report falls into two sections. Section A consists of a review of the agricultural industries of the Colony, while Section B gives an account of work carried out by the department. Both sections are very brief, in accordance with the wartime requirements.

The production and marketing of foodstuffs and the operation of various distribution control systems continued to occupy much of the time of the staff, to the detriment of normal work—particularly investigational work. There was no change in general policy during the period under review, but the agricultural policy of the Colony and the work of the department was investigated by Dr. C. Y. Shephard, Carnegie Professor of Economics at the Imperial College of Tropical Agriculture, Trinidad. Professor Shephard's report was under consideration by Government at the close of the year.

SECTION A.—REVIEW OF AGRICULTURAL INDUSTRIES.

Climatic and General.

Weather conditions were generally unfavourable throughout the Colony. In the wet zones exceptionally heavy rainfall in the first four months of the year depressed the rate of growth of pasture and adversely affected vegetable production. Drought conditions later in the year delayed rice planting and was unfavourable for late cane plantings and vegetable production. Pastures in the dry zone also suffered. Plantation crops were generally not affected and there were no serious hurricanes.

Towards the end of the year labour conditions were easier but estate agriculture, copra, pineapples and dairying, was unable to work to full capacity.

Although no serious food shortage was apparent except in the Yasawa Islands group, food production was barely sufficient in many localities owing to the difficulties of reduced manpower, the circulation of easily earned money, the depredations of bush pigs and, in the case of bananas, to two storms which struck the main producing areas on Viti Levu early in the year.

Principal Export Crops.

Sugar Cane.—All cane was harvested, including that left standing from 1943, realizing rather less than half normal tonnage. Although the price of cane was further increased, growers did not fully benefit thereby. The disturbance through labour troubles interfered with normal operations so that only half the normal area was planted.

Improved relations between growers and crushers late in the season resulted in a much greater interest being taken in replanting sugar cane. However, by this time conditions were no longer favourable for planting and many farmers were obliged to delay planting until late in the year.

Season 1943-44—		
Area cropped	... ...	23,842 acres.
Cane crushed	... ...	434,585 tons.
Sugar exported	... ...	54,774 tons.

Copra.—Production increased somewhat over 1943. Grading at Suva and Levuka was continued, this disclosing that a lower proportion of Plantation Grade was being produced in 1944, though the total quantity of this grade was only slightly reduced. All export copra was again purchased by the Ministry of Food, London.

Bananas.—Exports reached the lowest yet recorded for some years due, amongst other things, to the two small hurricanes which affected production areas on Viti Levu and the islands of Gau and Koro, in addition to the war-time neglect of plantations. Local consumption showed a downward tendency towards the end of the year, thereby releasing extra fruit for export. Quality still remained below pre-war standards but higher standards were asked for and were forthcoming towards the end of the year. Some interest in the replanting of plantations was displayed following the release of men from war work and the services. The supply of case timber, and therefore cases, fluctuated throughout the year, causing considerable anxiety to all concerned in the banana industry. Purchase by New Zealand was again at a flat f.o.b. rate, being 10s. 5½d. from January to September, increased to 10s. 11½d. from September onwards. In addition some 2,600 cases were forwarded to military hospitals nearer the fighting zone.

Pineapples.—Operations of the pineapple canning industry were on a similar scale to that of preceding wartime years.

The operating company aims at maintaing a seed supply to enable rapid expansion when conditions return to normal.

Disease control and fertilizer trials were carried out under field conditions.

The export of canned fruit was negligible, production being reserved for local consumption mainly by the forces. However, at the end of the year fresh fruit was available in fair quantity and some 1,300 cases were shipped to New Zealand, while 956 cases were forwarded to military hospitals overseas.

Citrus.—No export of citrus to New Zealand was possible, although 186 cases were forwarded on private consignment.

Watermelons.—Export of this crop was resumed in December, a total of 2,706 fruits being forwarded to New Zealand, realizing a good cash return to the exporter.

Tapa.—No interest in this fibre crop, for which repeated inquiry continues to be made from London, is yet apparent, due primarily to the difficult labour situation and attention to more profitable lines.

Ginger.—Green ginger exports to New Zealand increased to some 32 tons during the year.

Tomatoes and Mangoes.—Export of these fruits was resumed, some 300 cases of each being forwarded.

In addition to the above about 200 cases of mixed produce were also consigned to New Zealand.

Crops for Local Consumption.

Rice.—The shortage of local rice on the market persisted, though many farmers continued to carry larger stocks than in normal times. Yields for the 1943-44 season were definitely good, but again exact records of actual yield are not available and reliance has to be made on estimates of yields in various centres. The incidence of pests and diseases was greater than in former years, the condition known as "Rice Yellows" appearing to be on the increase.

Some importation of rice was made on Government account to supplement local production.

Maize.—An acute shortage of this grain was particularly evident towards the end of the year, largely due to growers preferring to plant tobacco which had proved a remunerative crop. Prices ranged up to 45s. per bag of 200 lb. Suva.

Groundnuts.—Interest in this crop continued to increase and prices remained high, 1s. per lb. wholesale being demanded in Suva. However, troop movements brought about a general fall in local sales and prices. The same interest in small-scale crushing for preparation of cooking oil for local sale was manifest but the high price of nuts prevented any real progress being made in this direction.

Pulses.—The production and supply of pulses for local consumption does not yet meet full local requirements, consequently no exports to New Zealand were possible.

Root Crops.—The demand for native roots from the military forces continued to be heavy and it proved exceedingly difficult to meet that demand, dalo being in very short supply. Increasing damage by bush pigs was reported for several producing areas.

Tobacco.—The anticipated continuation of high prices for "leaf" and "uma" tobacco prompted further increased plantings so that when the crop was harvested supply greatly exceeded demand which resulted in prices falling to more reasonable levels.

Fruit and Vegetables.—The season was not a good one for European type vegetables and production was less than in the previous season; quality also suffered by reason of dry spells. Demand fell considerably and in consequence production is once more largely in the hands of the regular market gardeners.

Animal Industries.

Dairying.—The total amount of butter produced by the two factories operating in the Colony was 623,347 lb. This represents an increase of 200,193 lb. compared with the average of the two years immediately preceding the war but is in fact lower than the corresponding figure for 1943 by 97,235 lb. This lower production is due to inadequate labour on dairy farms which has prevented effective weed control and pasture improvement.

Because of lowered production a much larger quantity of butter (41,692 lb.) was imported into the Colony to meet local demand. In addition only 12,354 lb. of ghee was made which is less than has been the practice in past years, and consequently a very much larger amount of ghee had to be imported. There was, however, no interference with ghee production by peasant farmers and it is estimated that production from this source is well up to the average of past years.

Towards the latter part of the year the labour position improved and efforts were made by many farmers to improve pastures. The effect of this does not show in the production figures for 1944, however.

The health of dairy animals remained good and tuberculin testing was continued in all dairies supplying whole milk and a number of those supplying butterfat to factories. A larger number of calves was raised due to more enlightened calf-raising methods practised by farmers.

Beef Production.—The assistant controller issued quotas to all butchers stipulating the number of cattle and the poundage of beef which could be killed in each month. This amounted to 3,713 head representing 1,856,500 lb.

of beef for all butchers for the year, allowing 500 lb. per head dressed weight. Butchers actually killed 4,329 head representing 2,065,863 lb. of beef. It will be seen from this that the beef position showed definite indications of improvement. This was due to two causes, firstly, the effect of Regulation 50 of 1941 which prevents the slaughter of a steer under the age of three years and of a cow under the age of eight years ; and secondly, the tendency on the part of producers to come forward with cattle more willingly, as income from other sources had dropped considerably and producers were not so inclined to hold out for the high prices which cattle had previously commanded. There was still a tendency for cattle on the hoof to be sold at a higher price than the equivalent of £2 per 100 lb. dressed weight, but this tendency gradually decreased during the year under review.

The average dressed weight of beasts killed was 507 lb. The quota figures are based on a figure of 500 lb. dressed weight. A large number of beasts killed were working bullocks, and consequently there were some reports of a shortage of bullocks for cultivation.

A notable feature was the effort made by a planter on the island of Taveuni to trap wild cattle which inhabit the rugged central part of that island and which have bred for many years without control. This proved quite successful and, although some of the beef produced was not of high quality, it commanded a ready market in Suva.

Pigs.—Supplies were considerably short of demand and there was a marked tendency for prices higher than the controlled price of 9d. per lb. dressed weight to be demanded by many producers. The retail controlled price of 1s. 3d. per lb. was established and adhered to during the year.

The Pig Fattening Scheme conducted by this department was responsible for the sale of 373 pigs, practically all of which were for slaughter. As the amount of swill available from army camps was considerably reduced during the year the scope of the scheme was also reduced, with the intention of closing it down altogether in the near future.

Poultry.—The demand for eggs was far in excess of supply throughout the year and many householders who normally purchased eggs but were unable to procure any turned to back-yard poultry raising. Many of these have been remarkably successful and besides producing a most valuable foodstuff have developed a very interesting hobby. There is no doubt that this has assisted in relieving the egg shortage to a considerable extent.

Army purchases accentuated the egg shortage for the civil population but as these purchases decreased toward the latter part of the year, the position then became less acute for civilians.

There was still a marked tendency for prices to be paid in excess of the controlled prices of 2s. 6d. per dozen wholesale and 3s. per dozen retail.

It is noteworthy that many producers have endeavoured to improve the quality of their flocks by importations from New Zealand of well-bred birds. Every ship arriving from New Zealand during the year carried birds for local breeding purposes.

Fisheries.—With the cessation of large fish deliveries to the army the supply position on the Suva market became a little easier. Fishing equipment was made available from overseas supplies and this stimulated the industry to some extent. However, demand continues to exceed supply on the Suva market and at Nadi though in other centres supplies were adequate. No

staff or funds were made available for extending the work of the fisheries division and consequently activity in this direction was limited to the issue of licences, advice to fishermen and, in a few cases, help in obtaining equipment.

Goats.—Goats were still insufficient in numbers to supply the goat-flesh market. Early in the year goat flesh sold for as high as 3s. per lb. This later dropped to 1s. 6d. Lack of adequate grazing facilities was the main factor in preventing the development of the industry. Disease and wild dogs are other limiting factors.

Ringworm in Horses.—An outbreak of ringworm in horses occurred during the latter part of the year in the Lautoka district and before the end of the year had spread through the Western District and part of the Eastern District. Control measures were commenced as soon as this disease was seen in Lautoka but it was impossible to prevent its spread to the other areas named. A campaign to deal with the disease was commenced in the Ba area and is now being extended.

Brands.—Five hundred and twelve new brands were registered during the year bringing the total number registered up to the end of 1944 to 2,969.

SECTION B.—WORK OF THE DEPARTMENT.

FIELD AGRICULTURAL AND PRODUCE INSPECTION DIVISION.

Experimental.

Investigational work has again been severely curtailed through war activities, shortage of labour and the still urgent necessity of stimulating food production amongst Indians, Fijians, etc., and operation of the various controls of agricultural implements, barbed wire, rice, vegetables, meat, etc.

Crop variety collection work was maintained and observation of rice varieties continued, while actual rice plantings were recorded with considerable accuracy for Viti Levu and Vanua Levu.

Nurseries of budded citrus were extended and maintained and all successful buddings of the previous season were distributed. Again demand exceeded supply.

This year's buddings proved very successful and were already showing good growth at the end of the year.

The departmental Research Committee was revived and drew up an outline of investigational work required in the Colony, for consideration by Professor Shephard.

Extension Work.

The field staff was again compelled through war conditions to devote most of its time to the production, collection and distribution of essential foodstuffs for military consumption at home and abroad, together with maize, rice, pulses and native roots for local requirements, excellent work being done by these officers and their staffs under difficult conditions.

The survey by a Lands Department surveyor of the Toga Rice Scheme area was completed and reallotment of the surveyed blocks was made with the minimum inconvenience to tenants. Drainage of the area has also been completed, while in November a thorough soil survey of the area was made under the supervision of the Senior Chemist.

Planting statistics were collected for rice and the collection of food crop plantings by Fijians was initiated in co-operation with Fijian provincial authorities.

No extension work in connexion with soil erosion or mixed farming was possible, but the re-establishment of propagation of economic and ornamental plants was achieved.

The *Agricultural Journal* was produced each quarter but, with the practical cessation of investigational work during the war, it is increasingly difficult to secure original articles of merit.

No leaflets or pamphlets were published but various articles of practical interest to farmers were published in the press, including a series of vegetable gardening notes.

Demonstration Farms.

The demonstration farms of the wet and dry zones were maintained, being employed primarily in food production, while soil erosion methods already adopted have been maintained and, where possible, extended.

Owing to the absence of Fijian men on active service little extension work was possible but some was applied to those small farmers and individuals who were producing much of the foodstuffs for the military and local population.

With the steady distribution of fencing materials damage from stock trespass was greatly reduced.

Agricultural Education.

The recruitment of Fijian agricultural students at the Sigatoka and Naduruloulou Experiment Farms was continued as vacancies occurred, but again, while Fijians were keen and eager for training, little or no response was made by the Indian farmers and their sons. Little time could be given by Agricultural Officers to the training of these boys or to visits to rural schools.

The Colonial Sugar Refining Company training scheme at Drasa continues to draw Fijian students for training in sugar-cane farming.

Produce Inspection and Marketing.

The field staff and Acting Produce Inspector were again fully occupied in meeting the still heavy demands of the forces stationed here, as well as those of the local population.

Deliveries of fresh fruit, vegetables and native roots amounted to 8,637,153 lb. valued at £68,000, compared with 15,524,596 lb. valued at £90,000 last year. In addition some 336,814 lb. of fruit valued at £4,000 were supplied to military hospitals nearer to the fighting zone. A large proportion of all this produce was supplied by numerous smallholders, mainly Fijian, who were organized for seed distribution, planting, collection and delivery of this produce together with much of the detailed payments, by members of the department field staff. The Fijian Co-operative Marketing Association Ltd. and sundry Fijian marketing clubs afforded great assistance in this work, as did many of the Chinese market gardeners and contractors.

The inspection and grading of copra was continued at Levuka and Suva, over 300,000 bags being examined. Green copra purchase licences were renewed and efforts were made towards the improvement of the quality of copra produced, but labour and shipping difficulties hindered progress.

All bananas for export to New Zealand and elsewhere were inspected and graded at Suva but, due to two hurricanes, lack of replanting and difficulties in securing charters for boats collecting from island areas, the total forwarded overseas was the lowest on record for many years, totalling only 36,667 cases valued at approximately £F.19,400.

In addition, however, consignments of fresh pineapples, watermelons, green ginger, mangoes and other fruits, showed some increase on previous war years.

The supervision of banana licence areas, shipment quotas and much detailed work concerning shipments, was, as usual, undertaken by the office of the Produce Inspector. In addition a considerable amount of time was absorbed in an endeavour to secure increased banana case production and ensure equitable distribution as they were available.

Some 11,870 lb. of tobacco leaf were purchased during the year, of which 1,974 lb. were resold as leaf tobacco, while 8,000 lb. odd of stick or twist tobacco were manufactured, nearly 7,000 lb. of which were sold, with the leaf already referred to, to the value of approximately £1,750.

Further, about 36 tons of maize were purchased and resold mainly to the public in an effort to make poultry foods available to the general public and stock owners.

Other produce handled by this office, on behalf of Fijians, consisted of cabbage, dalo and yams to the value of just over £200.

The usual inspection of shipping and cargoes of fresh vegetables for use by the military and civil population was made to ensure freedom from pests and disease.

VETERINARY DIVISION.

Inspections.—The following gives the number of stock inspected by Veterinary Officers, Stock Inspectors and Native Veterinary Assistants :—

Cattle	27,000
Horses	4,100
Pigs	1,965
Goats	5,000
Poultry	10,000

All districts with the exception of the Yasawas and Kadavu were inspected. It is noteworthy that Rotuma was inspected for the first time in seven years, and Lau was visited by a Veterinary Officer for the first time in 20 years.

Stock Improvement.—Under this ordinance the following stock were dealt with :—

Bulls—		Stallions—	
Licensed	254	Licensed	36
Castrated	725	Castrated	246
Castration ordered ...	55	Castration ordered ...	36

Importations.—The following stock was imported :—

Bulls 3, boars 4, sows 24, dogs 7, fowls 112, ducks 7.

The tuberculin test was carried out on 3,581 cattle of which 4.7 per cent gave a positive reaction. The testing included all cattle supplying whole milk to Suva town on which cattle, of the 724 tests carried out, only .96 per cent were positive.

In Lautoka of the 11 dairies supplying whole milk 10 were found to be completely free from tuberculosis.

Ringworm in horses made its appearance in Nadi and Lautoka as early as May. The disease has been observed in Nadi and Lautoka for the past six years. Previously the incidence had not been high and disappeared with change of season and the application of suitable dressings. During the year under review the incidence became much greater than before and the disease spread rapidly to Ba, Nadroga, Colo North, Colo West and Rewa. In some areas the incidence rose to 90 per cent. A large-scale campaign to combat the disease was commenced in the Ba area where the incidence was highest and preparations were made to extend the campaign to other affected areas.

Intestinal parasitism was responsible for a good deal of debility and death in young stock. Calves and chickens in particular suffered from this condition. Suitable treatment with drugs was found very effective in preventing losses and improving the condition of affected animals.

There was the usual low incidence of contagious abortion. This disease is enzoötic in a few areas but the incidence never increases and in one area where vaccination was carried out the disease appears to be gradually disappearing.

Clinical, pathological and bacteriological tests and examinations were carried out at Suva, Nadi, Ba and Labasa. The total number of cases dealt with was 1,582. This is 337 more than in 1943.

Pig Fattening Scheme.—This scheme showed a net profit of £155 15s. 4d. for the year. This figure would have been much higher had it not been for the fact that the sties at Lami had to be closed down and a complete new set built at Nasinu. This resulted in a reduction in the scale of operation and consequently of the number of pigs fattened.

Nasinu Farm.—This farm was carried on as a stock farm. The Pig Fattening Scheme was established on the farm and in addition pigs, poultry and cattle were maintained as a source of breeding stock for the farming community. The Child Welfare Milk Scheme was supplied with 3,778 gallons of milk from the farm cattle and the Colonial War Memorial Hospital was supplied with 876 dozen eggs not required as settings. Twenty-three dozen eggs were supplied as settings and 22 dozen were supplied for other purposes.

Ricketts Farm.—The supervision of Ricketts dairy at Tailevu was continued. Very little development work was possible since the farm was run on a trading account on which no over-expenditure is permissible and the number of milking cows on the farm was insufficient to give a return commensurate with the capacity of the farm.

The Senior Veterinary Officer was absent on duty for two months and away on leave for 3½ months of the year. The European Stock Inspector was absent on leave for two months. The remainder of the staff was on duty for the whole year.

RESEARCH DIVISION.

Chemical Activities.

With the staff situation still unimproved the chemical laboratory continued to maintain the restricted chemical services laid down in 1942.

These services comprise, (*a*) essential analytical and testing requirements of all Government departments including the military forces ; and (*b*) essential investigations.

During 1944 the work for the military forces decreased considerably with the result that some attention was given to important soil work which has been outstanding since 1942.

During the year 739 samples involving 2,000 separate determinations were received for analysis and are classified as follows :—

Foodstuffs—	
(*a*) Milks for Public Health	278
(*b*) Milks for Department of Agriculture	167
(*c*) Miscellaneous	22
Copra	9
Drugs	18
Liquors	31
Waters	26
Fertilizers	5
Toxicological	6
Forensic	17
Stores	4
Agricultural miscellaneous	8
Hydrocarbon oils	9
Miscellaneous	16
Soils	123
	739

Foodstuffs.—Milk samples from the Public Health Department were received from Lautoka, Nausori and Suva. In general the quality was good although action was taken against several milk vendors for watering.

The Senior Veterinary Officer submitted 167 samples of milk in connexion with herd-testing at Nasinu.

Miscellaneous samples included honey 2, bread 3, butter 2, dehydrated butter 1, cheese 1, peanut oil 6, ghee 6, margarine 1, and mustard oil 1. The bread samples were prepared by the Suva Gaol and were examined for vitamin B1 content. The following values were determined :—

Sample 1	95	gamma B1-100 grms.
Sample 2 (including wholemeal flour) ...	176	,,
Sample 3	101	,,

These values are good for unfortified bread.

Copra.—Nine samples were received for determination of free fatty acid and moisture.

Drugs.—Nine samples of suspected Indian hemp were examined with eight positive results. Two interesting cases of locally-made opium involving nine samples came under review. The material was made by the evaporation of 1 per cent tincture together with roasting and the incorporation of the product with dross and aspirin. An interesting technical point involved the detection of small quantities of maconic acid in the presence of large quantities of salicylic acid.

Liquors.—There was a large reduction in the number of samples of locally-distilled spirit submitted by the police. Three samples were submitted by the Customs Department for determination of proof spirit.

Fertilizer.—Three samples of bat guano were presented for examination. The samples were normal in composition, i.e. low in nitrogen and potash with 6 per cent to 7 per cent of phosphorus as P_2O_5. This material is of value on flower gardens or on the heavier soils but is uneconomic for commercial farming.

Forensic.—Several samples of clothing and earth were submitted by the police for the purpose of determining the cause of a fire which involved a fatality. The chemical evidence strongly supported a theory of accidental cause.

Toxicological.—Six samples, including four of a biological nature, were submitted for examination. Arsenic in large quantities was detected in one sample.

There was nothing of interest to report under the other headings dealing with general analytical work.

Soils.—As recorded above a reduction in work for the armed forces (the nature of which was referred to in the last annual report) permitted some attention being given to outstanding soil work.

Accordingly mechanical analyses, pH and other determinations were made on 60 soil samples taken in connexion with eight profile studies in Vanua Levu. In Viti Levu 62 samples from selected sites were examined similarly.

In general the following chemical information emerges :—

(1) All soils under natural conditions have a high lime requirement.
(2) The available phosphate status is average to low.
(3) The exchangeable bases and base exchange capacity of the marginal red soils are in general very low.
(4) In some areas, notably Vanua Levu, the nitrogen status of the soils is very poor.

It is obvious that very careful attention will have to be given to the management of the marginal soils and in passing it is interesting to note that the chemical findings are in agreement with field work with cane carried out by the Colonial Sugar Refining Company, notably in Labasa.

Equipment.—Certain new items of equipment referred to in the last annual report have now arrived and the laboratory now possesses :—

(*a*) a Lumetron photo-electric fluorimeter and colourimeter ;
(*b*) a Cenco grating spectrograph and accessories ;
(*c*) an electric muffle furnace ;
(*d*) a carbon combustion furnace ;
(*e*) equipment for vitamin determination in human and stock foods ;
(*f*) a Beck microscope.

This equipment, although of first importance in general analytical work, has special significance in agricultural research work. Particularly is this so in regard to the spectrograph and the photo-electric colourimeter, and when the laboratory is able to return to normal conditions these new and modern tools will be used to explore problems of soil, plant biochemistry and animal nutrition.

General.—In lieu of court attendance 46 certificates and two affidavits were issued in connexion with forensic cases. Fourteen certificates were issued under the Pure Food Ordinance.

The following articles were prepared by the Senior Chemist for the *Agricultural Journal* :—

(1) The Sugar Cane Soil of Rewa.
(2) Soils of the General Experiment Station, Sigatoka.
(3) Chemical Notes for No. 1 and No. 4.

ENTOMOLOGICAL ACTIVITIES.

Supplies of Black Leaf 40 and cryolite were obtained from the United States after a long wait and supplied to market gardeners. Knapsack sprayers ordered from Australia were issued to Chinese market gardeners and to Agricultural Officers for use against rice pests.

Among the chief pests were army worms (*Cirphis* and *Spodoptera*) in rice nurseries, the rice leaf-roller (*Marasmia*), cabbage caterpillars (*Plutella* and *Crocidolomia*), a cutworm (*Prodenia*) on tobacco, dalo and pumpkins and the stick insect (*Graeffea*) on coconut leaves. The worst stored-products pests were the rice weevil (*Calandra*) and the black fungus beetle (*Alphitobius*).

The first experiments in the Colony carried out with a very small sample of the new insecticide DDT were found to give good results against various mosquito larvæ.

Surveys of aerodromes and a sea plane base were carried out although the risk of introduction of the *Anopheles* mosquito has now greatly declined.

GENERAL.

Officers of the department served on the following official boards and committees :—

Director of Agriculture	Supply and Production Board, Native Lands Trust Board, Board of Education, Nutrition Committee, Advisory Committee on Production and Marketing (Chairman), Advisory Committee on Copra (Chairman), Weeds Committee (Chairman).
Senior Chemist	Pharmacy and Poisons Board, Nutrition Committee, Services Settlement Board.
Senior Veterinary Officer ...	Nutrition Committee, Advisory Committee on Production and Marketing, Weeds Committee, Services Settlement Board.
Senior Agricultural Officer ...	Advisory Committee on Production and Marketing (Member and Secretary).
Agricultural Officer Southern ...	Weeds Committee.
Government Entomologist ...	Weeds Committee (Member and Secretary), Quarantine and Mosquito Control Committee.

Tribute is again paid to the loyal work of the departmental staff, and to the co-operation of the District Administration and other departments, and of the staff of the Colonial Sugar Refining Co. Ltd.

C. HARVEY,
Director of Agriculture.

ANNUAL REPORT OF ENTOMOLOGIST FOR 1944.

1. Staff and Leave.

The two Fijian Laboratory Assistants continued their work. The Entomologist spent six of his eight weeks' interim leave at the Cawthron Institute, New Zealand. Two Fijian Assistant Mosquito Inspectors are paid for by the Medical Department.

2. Major Pests.

Cirphis unipuncta Haw., *Spodoptera mauritia* Boisd. and *Marasmia venilialis* on rice; *Margaroria indica* Saund. and *Leptoglosus australis* F. on pumpkin; *Crocidolomia binotalis* Zell. and *Plutella maculipennis* on crucifers; *Prodenia litura* F. on tobacco, dalo and pumpkin; *Dysdercus insularis* Stal. on cotton; *Graeffea crouani* (Le Guill.) on coconut foliage and *Calandra oryzae* L., *Tribolium castanum* (Hbst.) and *Alphitobius lævigatus* F. on bagged rice.

3. Minor Pests.

Dacus passiflorœ Frogg. in cocoa pods; *Agrotis ypsilon* Hfn. on potato; *Phthorimœa operculella* Zell. on tobacco; *Ephestia cautella* Wlk. and *Corcyra cephalonica* St. on stored rice; *Calotermes repandus* Hill in timber and *Lasioderma serricorne* L. in pyrethrum coils ("joss stocks"). The biting flies *Culicoides mollis* Edw. and *Simulium jolyi* Roub. were pests.

4. Beneficial Insects.

The beetle *Pachylister chinensis* Quens. was sent to Taveuni and to Australia as a predator against the buffalo fly (*Lyperosia exigua* de Meij.); the West Indian thrip, *Liothrips urichi* Karny was sent to Vanua Levu, Tailevu and Naitamba Island for control of *Clidemia* and the lace bug *Telonemia scrupulosa* Stal. to Rotuma against lantana. Good reports continue to arrive of the control of the banana borer (*Cosmopolites sordidus* Germ.) in Tahiti by the beetle *Plœsius javanus* Erich. The egg parasite *Microphanurus basalis* Woll. has been recovered in the field from eggs of the green vegetable bug *Nezara viridula* L. A request from Honolulu for a consignment of *Megarhinus splendens* Wied. could not be complied with as this predacious mosquito has failed to become established in Viti Levu. The fruit fly parasite *Melittobia indicum* Silv. was also reared and 29,300 released.

5. Mosquitoes.

Good results were obtained with a five per cent solution of DDT in Diesel oil against Culicine mosquito larvæ—the first experiments made in the Colony. Only a few ounces of DDT were available and tests wer confined to swampy ground, disused air raid shelters and drains. A newly described mosquito is *Aedes* (*Levua*) *geoskusea* Amos, this name having priority over *A.* (*L.*) *suvœ* Stone and Bohart. Larvæ of *Culex sitiens* Wied. were reared artificially in sea water though they breed naturally in brackish water. *Mansonia crassipes* van de Wulp was found breeding in Nadroga Province. Distribution of *Gambusia* (top minnows) and *Anisops cleopatra* Dist. (back swimmers) was continued as both are useful predators of mosquito larvæ. Routine inspection and oiling were also carried out and meetings of the Quarantine and Public Health Committee attended.

6. Insecticides.

The sale of these reached the record figure of £195, this included the first use of cryolite in the Colony which suffered a shortage of Black Leaf 40 used extensively by Chinese market gardeners. The usual control of scales, mealybugs, green flies, caterpillars and cockroaches was carried out as well as of bed bugs, fleas, bees in houses and slugs.

7. Identifications.

As in the past, grateful assistance is paid to the Director of the Imperial Institute of Entomology for identifications, 248 (252) specimens being identified of which 20 (13) were hitherto new to the National Collection and 3 (4) new to science. (Figures in brackets are for 1943). Similar acknowledgement is also made to Mr. C. F. W. Muesebeck of Washington and Mr. E. C. Zimmerman of Honolulu.

8. Miscellaneous.

Inspection of an overseas vessel for carriage of the rhinoceros beetle *Oryctes rhinoceros* L. was carried out; this pest occurs in Samoa, Uea or Wallis Island and Niuafoo. Assistance was given for the control of *Papuana hubeneri* Frm. in the Solomons. The scale *Aonidiella aurantii* Mask. was intercepted by the Produce Inspector on lemons from New South Wales; 21 articles were written for the *Agricultural Journal* of which the Entomologist acts as editor. Distribution was made of a Hindi pamphlet on rice pests and a series of articles on chemical control of insects was written for the local newspaper. Details on agriculture in the Solomons were supplied to Professor C. Y. Shephard on his visit in connexion with agricultural reorganization.

9. Weather.

The rainfall for Suva was 112·52 inches being 7·68 inches below the 57 year average of 120·20. March with 14·73 inches was the wettest month and July with 5·41 inches the driest. There were no hurricanes during the year. March was also the hottest month (80·2.F.) and August the coolest (73·2.).

ENTOMOLOGICAL NOTES.

By
R. J. A. W. LEVER, B.Sc., D.I.C., A.I.C.T.A., F.L.S., Entomologist.

1. THE GIANT TOAD IN THE SOLOMON ISLANDS.

Adults of the giant or Surinam toad (*Bufo marinus* L.), introduced into Fiji from Hawaii in 1936, were forwarded to the British Solomon Islands early in 1940 and later reports indicated it was thriving on Guadalcanal (1). During August 1945, the writer took the opportunity of examining the stomach contents of three toads with the following results:—

Auki, Malaita:

One male: 2 Elaterids (click beetles); 8 small snails (*Subulina octona* Breug.).

One female: 3 caterpillars; 4 *Subulina*; 1 centipede.

Lunga, Guadalcanal:

One female: 2 large Pentatomids (shield bugs); 2 small Pentatomids (*Geotomus* sp.); 2 Scarabaeidae (cockchafers); 2 earwigs; 1 ant.

In addition there were vegetable detritus, coral pebbles and a male coconut flower which were taken presumably while catching the insects with its tongue, the muscular contraction involved being described in an earlier issue of this *Journal* (2). The toads were also seen in large numbers on Banika, Russells.

It is interesting to note how frequently the small snail *Subulina* features in the toad's diet, this having first been recorded in Fiji in 1937 (3), while the bug *Geotomus* was taken from a toad in Suva in the following year.

REFERENCES.

(1) Lever, R. J. A. W., 1942—*Agric. Jour.*, Fiji, Vol. 13, No. 3, Sept., p. 81.
(2) Anonymous, 1943—In *Agric. Jour.*, Fiji, Vol. 14, No. 4, Dec., p. 108.
(3) Lever, R. J. A. W., 1938—*Agric. Jour.*, Fiji, Vol. 9, No. 4, Dec., p. 28.
(4) Lever, R. J. A. W., 1938—*Agric. Jour.*, Fiji, Vol. 9, No. 2, June, p. 28.

2. FURTHER NOTES ON THE PLANT BUGS *CYRTORHINUS*.

In the issue of this *Journal* for March (p. 11) it was stated that all specimens of the common plant bug *Cyrtorhinus* had turned out to be *C. fulvus* Knight rather than *C. mundulus* Breddin said by a writer in 1939 to be the only species in Fiji. It has since been found that both do in fact occur here *C. fulvus* on taro leaves and stalks while *C. mundulus* is restricted to sugar cane where it feeds on the eggs of another leaf-hopper *Perkinsiella vitiensis* Kirk., the well known vector of the virus which causes the so-called " Fiji " disease of cane.

3. A NEWLY RECORDED PARASITE, *PACHYCREPOIDEUS*.

Identification has recently been received of a small Pteromalid parasite. *Pachycrepoideus dubius* Ashm., reared in Suva from pupal houseflies, blowflies and fruitflies. Although recorded from the housefly in Australia and from two genera of fruitflies (*Ceratitis* and *Dacus*), the vinegar fly (*Drosophila*) and Tachinid *Ceromasia* in Hawaii, this is its first record from Fiji.

The hosts from which *Pachycrepoideus* has so far been reared locally are *Musca domestica* L., *Sarcophaga* spp. and *Dacus passiflorae* Frogg., the first two in cow dung and the latter in ripe fruit. Development takes 16 or 17 days.

It is not possible to say with certainty whether this is an introduced or an indigenous parasite; in Hawaii it was deliberately introduced from the Philippines in 1914 (1) but had been recorded three years earlier, perhaps from Amboina.

REFERENCE.

(1) Bianchi, F. A. 1940—*Proc. Hawaiian Ent. Soc.*, Vol. 10, No. 3, Aug. p. 380.

4. A ZANZIBAR PARASITE FOR THE RHINOCEROS BEETLE IN SAMOA.

Bulletin No. 21 of this Department described in detail how Mr. H. W. Simmonds, O.B.E., succeeded in 1939 in forwarding from Mauritius and Madagascar 210 live parasites to Samoa for biological control of the rhinoceros beetle (*Oryctes rhinoceros* L.). The parasite, a large reddish-brown Scoliid wasp (*Scolia oryctophaga* Coq.) did not, unfortunately, establish itself in Samoa.

As Mr. Simmonds explains in his bulletin, he had great hopes of a black Zanzibar species (*S. ruficornis* F.) and, but for the war, this project would have been carried out. However, at the first opportunity Mr. Simmonds went to Zanzibar and the writer had the opportunity this August of feeding (with agar agar and honey) and looking after his second batch of about 70 of these wasps sent by air via Sydney and Suva to Apia. Unfortunately the first batch, after being unavoidably held up in Honolulu, was overcarried to Sydney and most of the parasites had perished before reaching Samoa. Four more batches were reported to be successful but were not seen in transit through Fiji.

Details of the 1939 project, with an interesting account of *Scolia ruficornis*, are to be found in the *Agricultural Journal* for September 1941 (Vol. 12, No. 3, p. 89) to which readers are referred for fuller details.

5. THE MOSQUITO *AEDES VIGILAX*—A CORRECTED DISTRIBUTION FOR FIJI.

In this *Journal* for September, 1940 (1) reference was made to a mosquito, taken in March of that year at Korolevu and Suva, which had been identified in June 1940 by the late Dr. F. W. Edwards, F.R.S., Deputy Keeper of Entomology, British Museum, (Natural History) London, as *Aëdes* (*Ochlerotatus*) *vigilax* Skuse previously recorded from Austro-Malaya, Australia, Siam and New Caledonia.

Despite intensive searches in Fiji, particularly from 1942 to 1944, no further adults were taken nor were larvæ ever found and it was soon realized either that the mosquito had arrived in some ship or plane or it was a case of misidentification. The latter has turned out to be the explanation, final proof not being possible until authentic specimens of *A. vigilax* were available. During July 1945, the writer took a good series of these day-biting mosquitoes at Tontouta, New Caledonia, which curiously enough was the very spot where Buxton (2) recorded it 20 years ago as " very common and very troublesome during the day and evening." Comparison of these with the 1940 Fiji specimens showed at once that these latter were *A.* (*Aedimorphus*) *vexans* Meig., a well-known night-biting mosquito breeding chiefly in grass pools and man-made puddles. The writer's earlier reference is therefore incorrect but it will be realized that determination by a well-known specialist on mosquito identification could not be queried without very definite proof. Further, readers will recognize that war-time conditions in London did not permit of leisurely examination of material much of which, in any case, had been evacuated into the country. Dr. Edwards died in November 1940, so he could not check his determination.

Post-war aerial traffic could however, easily bring in this salt marsh mosquito from New Caledonia—825 statute miles from Suva—and the following comparison will serve to separate these two mosquitoes, both of which have finger-like processes on the apex of the abdomen in the female and very similar colouration:—

Aëdes vigilax.	*Aëdes vexans.*
1. Wings with some pale scales.	1. Wings entirely dark scaled.
2. Thorax almost black.	2. Thorax chocolate-brown.
3. Proboscis ventrally distinctly demarcated into pale and dark areas.	3. No such clear demarcation in proboscis viewed ventrally.
4. Many dark, forked upright scales on top of head (vertex).	4. Forked upright scales restricted to posterior part of head.

Acknowledgement is made to Dr. F. X. Williams (3) for most of the characters enumerated above. He recorded *A. vigilax* as " breeding in a stagnant part of a mangrove swamp at Nouméa where it was associated with *Culex sitens*," conditions which exist on both Viti Levu and Vanua Levu in Fiji.

The larva has the small, rounded anal papillæ of the saline water type but the short siphon with its strong pecten will prevent confusion with *Culex sitiens*.

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(1) Lever, R. J. A. W.—1940. *Agric. Journal*, Fiji. Vol. 11, No. 3, Sept. p. 82.
(2) Buxton, P. A.—1927. " Researches in Polynesia and Melanesia," London School of Hygiene and Tropical Medicine, page 95.
(3) Williams, F. X.—1943. *Hawaiian Planters' Record*, Vol. 47, No. 4, pp. 212–215.